

## CLAIMS

What is claimed is:

1. A method for evaluating one or more materials in accordance with size of particles therein, comprising:

evaluating a spectrum of light reflected from a first group of particles;

evaluating a spectrum of light reflected from a second group of particle;

comparing results of said evaluating of said first group with results of said evaluating of said second group; and

providing an indication of a state of said material when said comparing produces a predetermined comparison result.

2. The method of claim 1, used for monitoring a process wherein size of particles is changing as a function of time, and wherein:

said evaluating of a spectrum of light from a first group of particles comprises evaluating a spectrum of light reflected from the particles at a first time;

said evaluating of a spectrum of light from a second group of particles comprises evaluating a spectrum of light reflected from the particle at a second time;

said comparing results comprises comparing results of said evaluating at said first time with results of said evaluating at a second time; further comprising

providing an indication of a state of said process when said comparing produces predetermined comparison results.

3. The method of claim 2, wherein the evaluating at at least one of said first time and said second time occurs during the process.

4. The method of claim 2, wherein the evaluating at at least one of said first time and said second time is an evaluating of a reference sample at a time other than during the process.

5. The method of claim 1, further comprising;

varying distance between a first light conductor for conducting light to said particles and a second light conductor for conducting light from said particles for said evaluations, and

evaluating spectra of light received from said particles at a plurality of distances between said first light conductor and said second light conductor.

6. The method of claim 5, wherein said distance is varied to eliminate spurious reflections from said groups of particles or from a container in which said particles are disposed.

7. The method of claim 1, wherein said particles are in a liquid, said particles being selected from a group comprising at least one of solid particles and liquid droplets.

8. The method of claim 7, further comprising moving, at a plurality of different times, a first light

conductor for conducting light to said particles and a second light conductor for conducting light from said particles along a column containing said liquid.

9. The method of claim 8, further comprising determining at least one of a rate of motion of an interface in said liquid, and characteristics of particles in a vicinity of said interface.

10. The method of claim 9, further comprising determining characteristics of particles on opposite sides of said interface.

11. The method of claim 1, further comprising determining compositional characteristics of said particles by analyzing at least one of said spectra, said compositional characteristics including at least one of particle size and chemical composition.

12. The method of claim 1, wherein said first group of particles and said second group of particles are successive groups of particles in a batch of particles undergoing a process of mixing, and said evaluating of said particles is performed at different times, to obtain an indication of homogeneity of a mixture containing said particles.

13. The method of claim 1, wherein said first group of particles and said second group of particles are successive groups of particles in a process flow stream.

14. The method of claim 1, wherein said first group of particles and said second group of particles are successive groups of particles in a process, further comprising using said results of said evaluating to

monitor changes in characteristics of said particles to obtain an indication of homogeneity of said particles.

15. The method of claim 1, used to perform at least one of classification of materials, monitoring of a process, determining authenticity of a product, and determining quality of a product.

16. The method of claim 1, used to determine size of particle in at least one of said first group of particles and said second particles.

17. The method of claim 16, wherein said at least one group of particles is suspended in a liquid characterized by a series of parameters and wherein the size of said particles is determined by utilizing a predetermined relationship between values of said parameters, a spectrum of reflected light from said particles and said particle sizes, to determine said sizes of said particles.

18. The method of claim 17, further comprising: varying distance between a first light conductor for conducting light to said particles and a second light conductor for conducting light from said particles for said evaluations.

19. The method of claim 18, further comprising repeating said utilizing at a plurality of distances.

20. A method for determining characteristics of a material comprising:

illuminating the material with coherent light so as to produce scattered light;

autocorrelating the scattered light;

preprocessing a signal representative of the scattered light to produce a processed signal;

performing at least one of a cumulant analysis and a cluster analysis to provide analyzed data; and

associating the analyzed data with particular characteristics of said material.

21. An apparatus for evaluating one or more materials in accordance with size of particles therein, comprising:

means for evaluating a spectrum of light reflected from a first group of particles and from a second group of particles;

means for comparing results of said evaluating of said first group with results of said evaluating of said second group; and

means for providing an indication of a state of said material when said comparing produces a predetermined comparison result.

22. The apparatus of claim 21, for monitoring a process wherein size of particles is changing as a function of time, and wherein:

said means for evaluating of a spectrum of light from a first group of particles comprises apparatus for evaluating a spectrum of light reflected from the particles at a first time and at a second time;

said means for comparing results comprises comparing apparatus for comparing results of said evaluating at said first time with results of said evaluating at a second time; further comprising

means for providing an indication of a state of said process when said comparing produces predetermined comparison results.

23. The apparatus of claim 22, wherein said means for evaluating evaluates at said first time and at said second time, during the process.

24. The apparatus of claim 22, further comprising a storage device for storing a reference produced at a time other than during the process, for evaluating at at least one of said first time and said second time.

25. The apparatus of claim 21, further comprising;

means for changing distance between a first light conductor for conducting light to said particles and a second light conductor for conducting light from said particles for said evaluations, and

means for evaluating spectra of light received from said particles at a plurality of distances between said first light conductor and said second light conductor.

26. The apparatus of claim 21, further comprising means for containing a liquid in which said particles are dispersed.

27. The apparatus of claim 26, further comprising means for moving, at a plurality of different times, a first light conductor for conducting light to said

particles and a second light conductor for conducting light from said particles along said means for containing said liquid.

28. The apparatus of claim 27, further comprising means for determining a rate of motion of an interface in said emulsion, and means for determining characteristics of particles in a vicinity of said interface.

29. The apparatus of claim 28, further comprising means for determining characteristics of particles on opposite sides of said interface.

30. The apparatus of claim 27, further comprising means for determining characteristics of particles in a vicinity of said interface.

31. The apparatus of claim 21, further comprising a flow cell through which a mixture containing said particles flows in order to have measurements performed thereon.

32. The apparatus of claim 31, wherein said flow cell is positioned to evaluate raw materials entering a process.

33. The apparatus of claim 31, wherein said flow cell is positioned to evaluate materials during a process.